299-W18-40 (C3395)

Log Data Report

Borehole Information:

Borehole:	299-W18-40 (C3395)		Site:	South of U Tank Farm	
Coordinates (Plant)		GWL (ft)[1]:	228	GWL Date:	9/19/01
North	East	Drill Date	TOC[2] Elevation	Total Depth (ft)	Type
Unknown	Unknown	Sept. 2001	Unknown	260	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel	2.7	10 7/8	9 3/8	11/16	2.7	258

Borehole Notes:

The BHI site geologist reported the GWL as an approximate depth. The logging engineer measured the pipe stickup at the borehole using a steel tape. Calipers were used to measure casing OD and thickness only; the casing ID is calculated.

Logging Equipment Information:

Logging System:	Gamma 2A		Type:	SGLS (35%)
Calibration Date:	09/00	Calibration Reference:		GJO-2001-246-TAR
		Logging Procedure:		MAC-HGLP 1.6.5

Logging System:	Gamma 2E		Type:	NMLS
Calibration Date:	05/01	Calibration Reference:		GJO-2001-247-TAR
		Logging Procedure:		MAC-HGLP 1.6.5

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4
Date	09/20/01	09/20/01	09/21/01	
Logging Engineer	Spatz	Spatz	Spatz	
Start Depth (ft)	0	120.0	244.0	
Finish Depth (ft)	121.0	260.0	218.0	
Count Time (sec)	200	200	200	
Live/Real	R	R	R	
Shield (Y/N)	N/A[3]	N/A	N/A	
MSA Interval (ft)	1.0	1.0	1.0	
ft/min	N/A	N/A	N/A	
Pre-Verification	B0056CAB	B0056CAB	B0056CAB	
Start File	B0056000	B0056122	B0056263	
Finish File	B0056121	B0056262	B0056289	
Post-Verification	B0056CAA	B0056CAA	B0056CAA	
Depth Return Error (ft)	+0.4	N/A	-0.25	
Comments				

Neutron Moisture Logging System (NMLS) Log Run Information:

Log Run	1	2	3	4
Date	09/19/01	09/20/01		
Logging Engineer	Spatz	Spatz		
Start Depth (ft)	0	198.0		
Finish Depth (ft)	231.0	175.0		
Count Time (sec)	15	15		
Live/Real	L	L		
Shield (Y/N)	N/A	N/A		
MSA Interval (ft)	0.25	0.25		
ft/min	N/A	N/A		
Pre-Verification	C0017CAB	C0017CAB		
Start File	C0017000	C0R17000		
Finish File	C0017928	C0R17092		
Post-Verification	C0R17CAA	C0R17CAA		
Depth Return Error (ft)	N/A	0		
Comments	Water detected below 231.0 ft.	Repeat interval.		

Logging Operation Notes:

Zero reference is the top of ground surface, and SGLS log depths are relative to ground level.

A longer count time (200 sec) was required with the SGLS because of the relatively thick casing. The borehole was logged in the drill pipe before completion as a groundwater monitoring well. In order to obtain reliable spectra while minimizing overall logging time, the depth interval was increased from 0.5 ft to 1.0 ft.

Fine gain adjustments were made after files B0056013 (13.0 ft), B0056040 (40.0 ft), B0056059 (59.0 ft), and B0056076 (76.0 ft) during logging run 1.

Log run 1 was terminated to refill the sonde with liquid nitrogen and to grease the PTO driveline.

Two spectra, files B0056261 and B0056262, may be from the sonde sitting on the bottom of the borehole in thick watery mud and may not represent true depth intervals.

During logging, the sonde is centralized in the borehole for both the SGLS and NMLS.

Analysis Notes:

Analyst:	Sobczyk	Date:	09/25/01	Reference:	MAC-VZCP 1.7.9 Rev. 2

Pre-run and post-run verification spectra for the SGLS were evaluated. The pre-survey verification spectrum (file B00056CAB) was within the control limits. However, the peak intensity for the 609-keV photopeak was below the lower warning limits for this pre-run verification spectrum. The post-survey verification spectrum for the logging (file B00056CAA) was below the lower control limits for all three of the peak intensities. On the basis of the acceptance criteria for the Gamma 2A system, both the pre- and post-verification spectra did not fulfill the acceptance criteria. Examinations of spectra indicate that the detector appears to have functioned normally during the log run, and the log data are provisionally accepted, subject to further review and analysis.

Individual spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with EXCEL. Corrections were applied for a casing thickness of 11/16 in. from the ground surface to 260 ft. A correction for water in the borehole was applied below 230 ft, and this depth was determined from the neutron-moisture log. Dead time corrections were not necessary. The rerun of the SGLS showed good repeatability.

Pre-run and post-run verification spectra for the NMLS were evaluated. The pre-survey verification spectrum (file C0017CAB) recorded 723 gross cps while the post-survey verification spectrum (file C0R17CAA) recorded 747 gross cps.

Moisture calibration models at Hanford for 10-in. holes with 11/16-in. casing have not been established. Thus, the neutron log was not processed to estimate volumetric moisture content because the relatively large borehole diameter and casing thickness are beyond the range of conditions for which the tool was calibrated. Neutron data are presented as gross counts. In general, an increase in neutron count is indicative of an increase in moisture content, but a quantitative calculation of volumetric moisture cannot be made at this time. The rerun of the neutron-moisture tool showed good repeatability.

Log Plot Notes:

Separate log plots are provided for gross gamma, naturally occurring radionuclides (^{40}K, ^{232}Th, ^{238}U, and associated decay progeny), and man-made radionuclides. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing and water corrections. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. A gross neutron log of neutron counts is also shown on the combination plot.

Results and Interpretations:

^{137}Cs was the only man-made radionuclide detected. ^{137}Cs activity was detected at two points near the ground surface. The measured ^{137}Cs activity was about 0.2 pCi/g at both the ground surface and at a log depth of 3 ft.

The changes in gross gamma counts depend primarily upon changes in ^{40}K activities. The increase in gross gamma counts from about 75 cps to about 115 cps at a log depth of 69 ft corresponds with an increase in apparent ^{40}K activity from about 10 to 15 pCi/g. This increase in total gamma is interpreted as the Hanford H2. The increase in ^{232}Th activity from about 0.8 to 1.0 pCi/g and the increase in gross gamma counts from 110 to 125 cps at 116 ft probably represent the top of the Early Palouse Soil. On the basis of low K-40 activities, the carbonate-rich paleosols of the Pliocene-Pleistocene are interpreted as being between 133 and 137 ft. The caliche layer with characteristically high uranium content (greater than 2.0 pCi/g) is present between 133 and 135 ft. The top of the Ringold is picked at 138 ft.

The neutron moisture tool's depressed response in this hole is due at least in part to the low-activity source, short source-to-detector spacing, and large borehole diameter. The highest neutron counts occurred in the groundwater as expected. The higher neutron counts that occurred in the 115- to 137-ft interval correspond with the Plio-Pleistocene as interpreted from the SGLS data.

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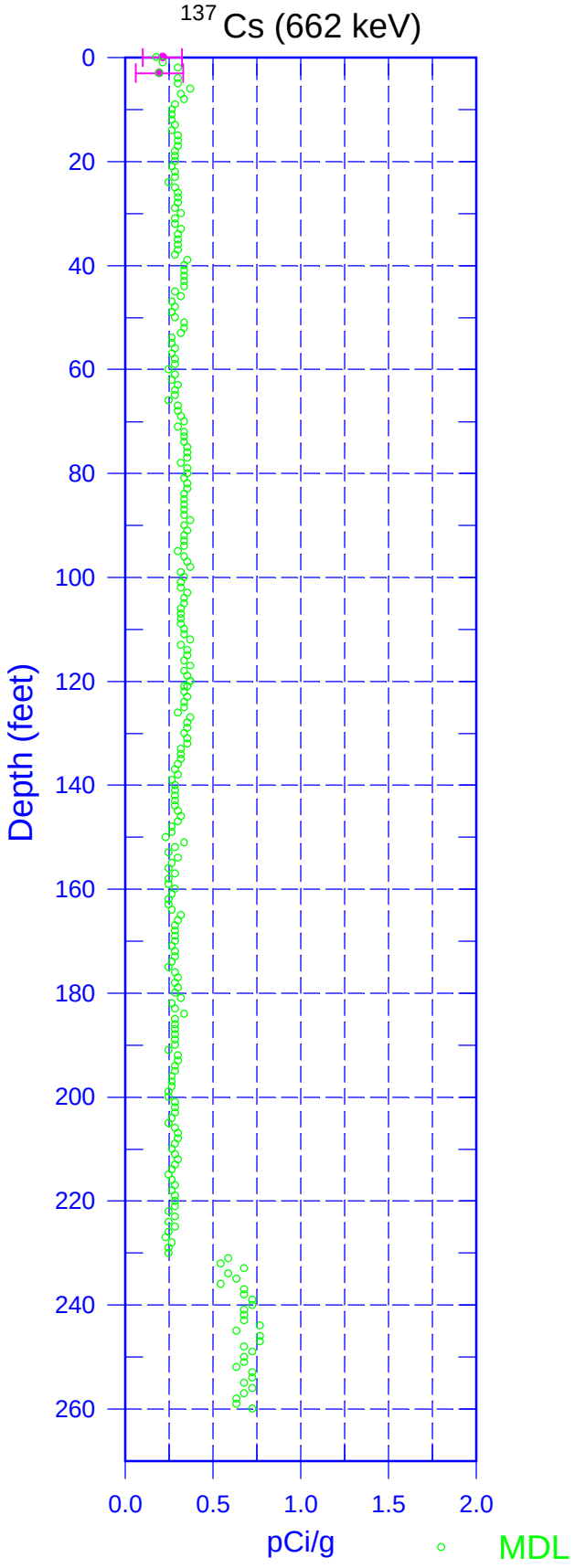
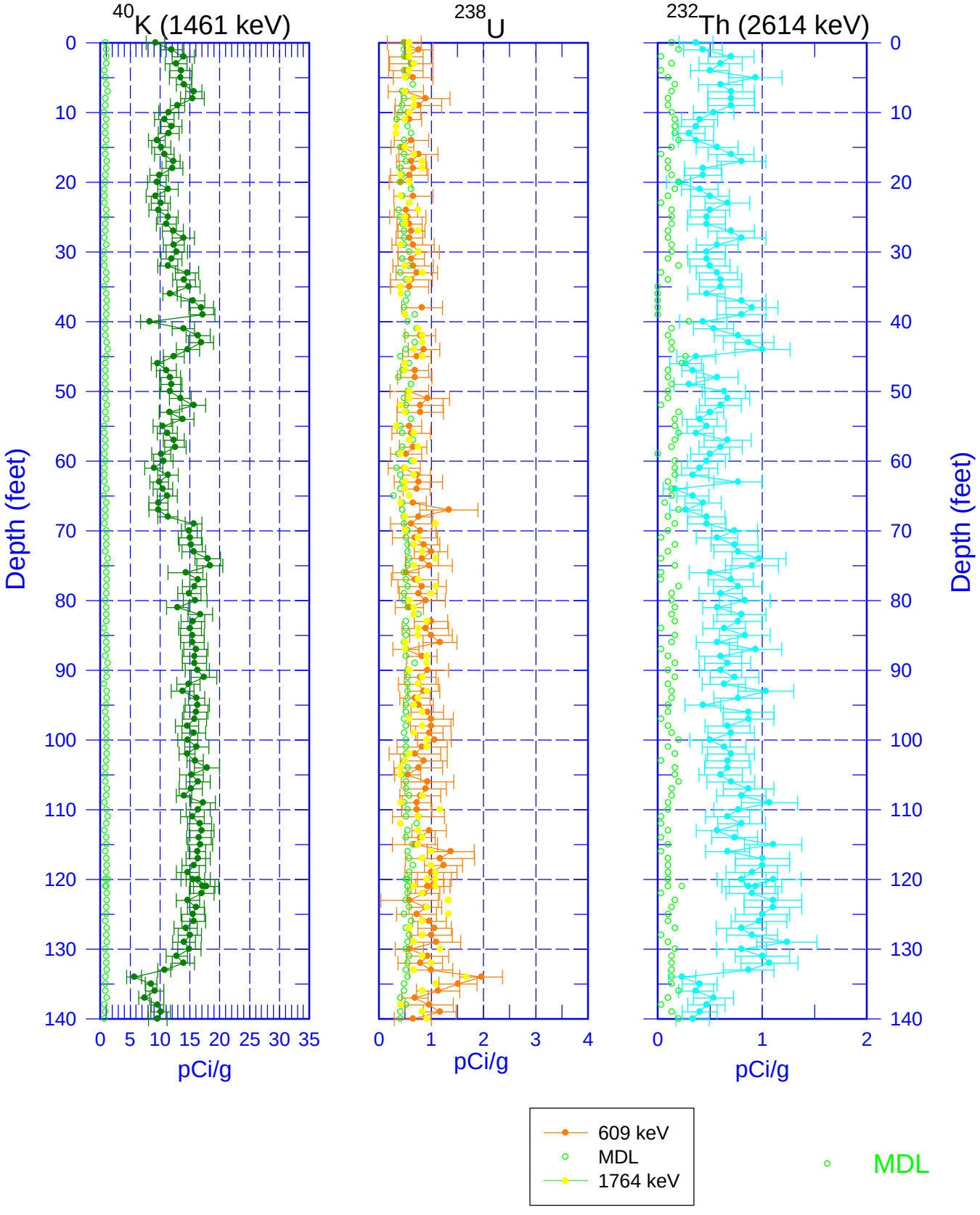
[1] GWL – groundwater level
[2] TOC – top of casing
[3] N/A – not applicable

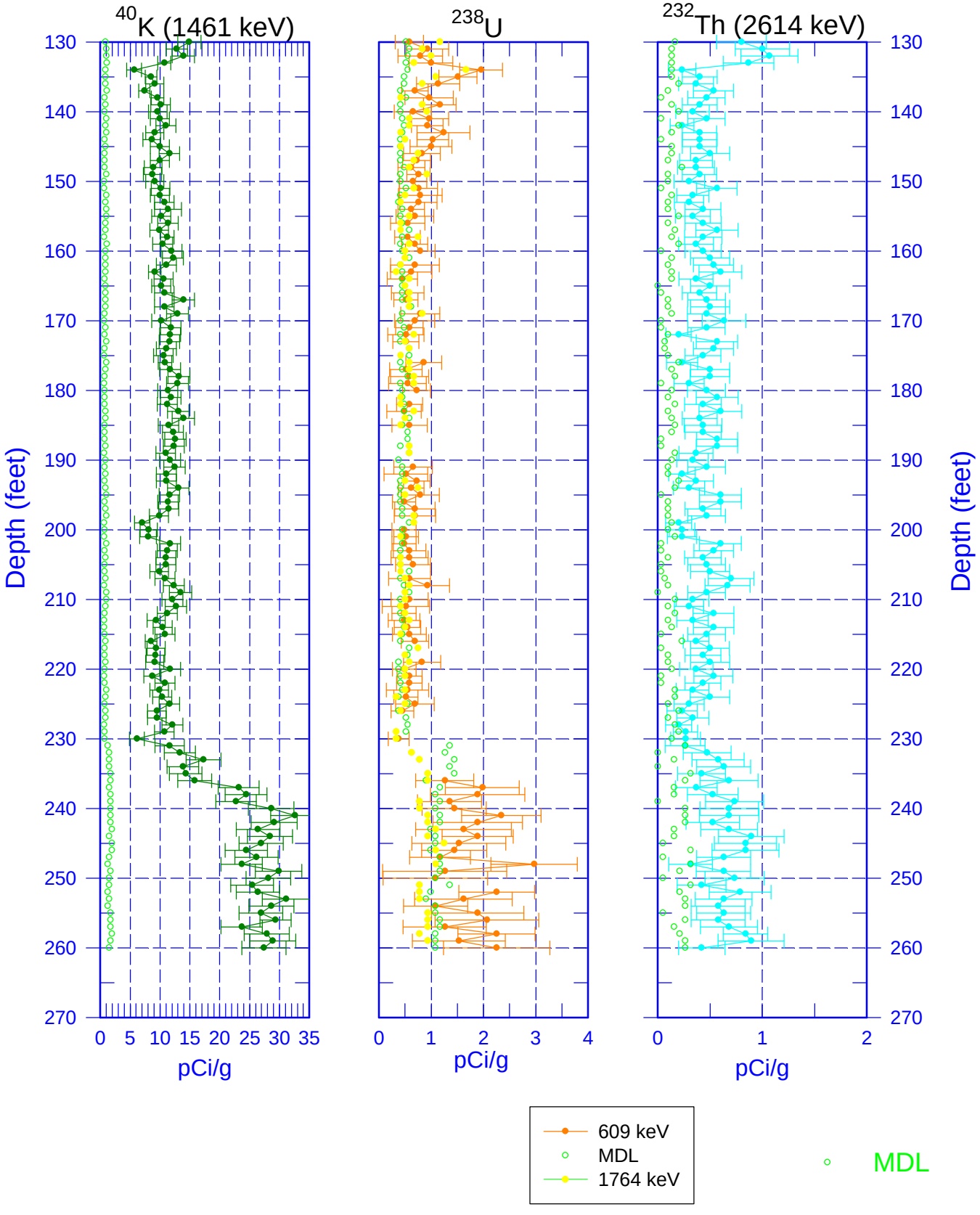
299-W18-40 (C3395)
Man-Made Radionuclide Concentrations



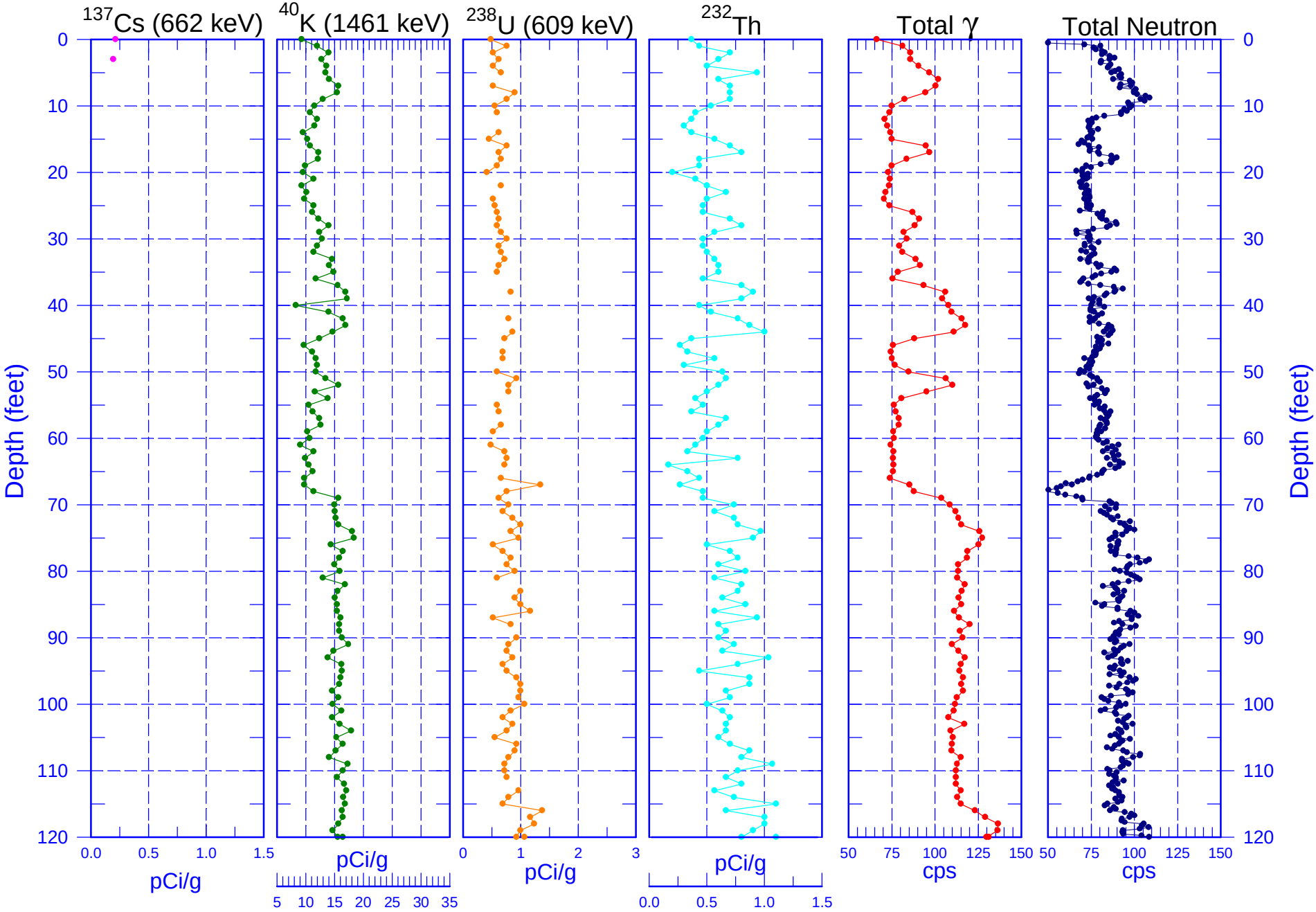
299-W18-40 (C3395)
Natural Gamma Logs



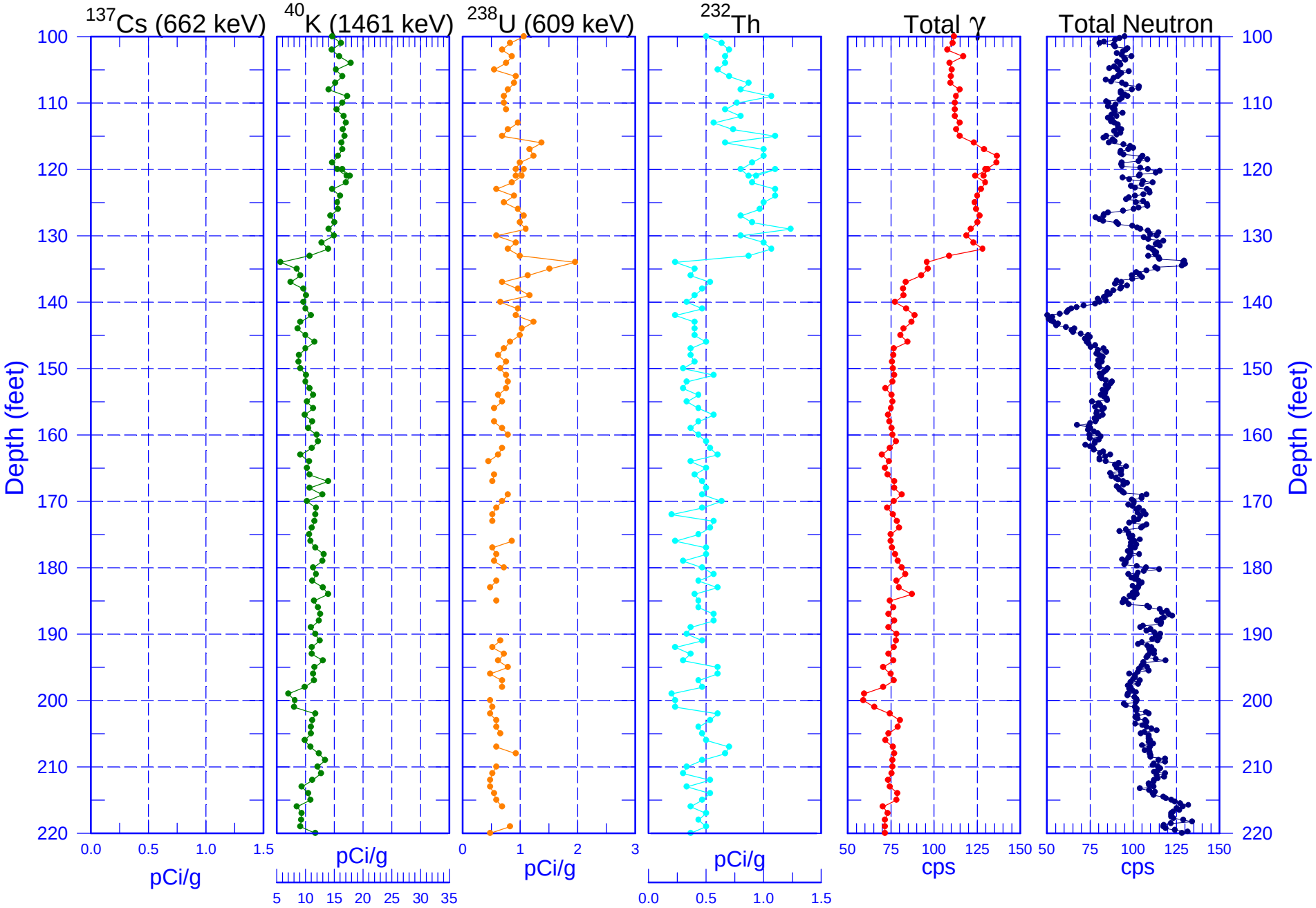
299-W18-40 (C3395)
Natural Gamma Logs



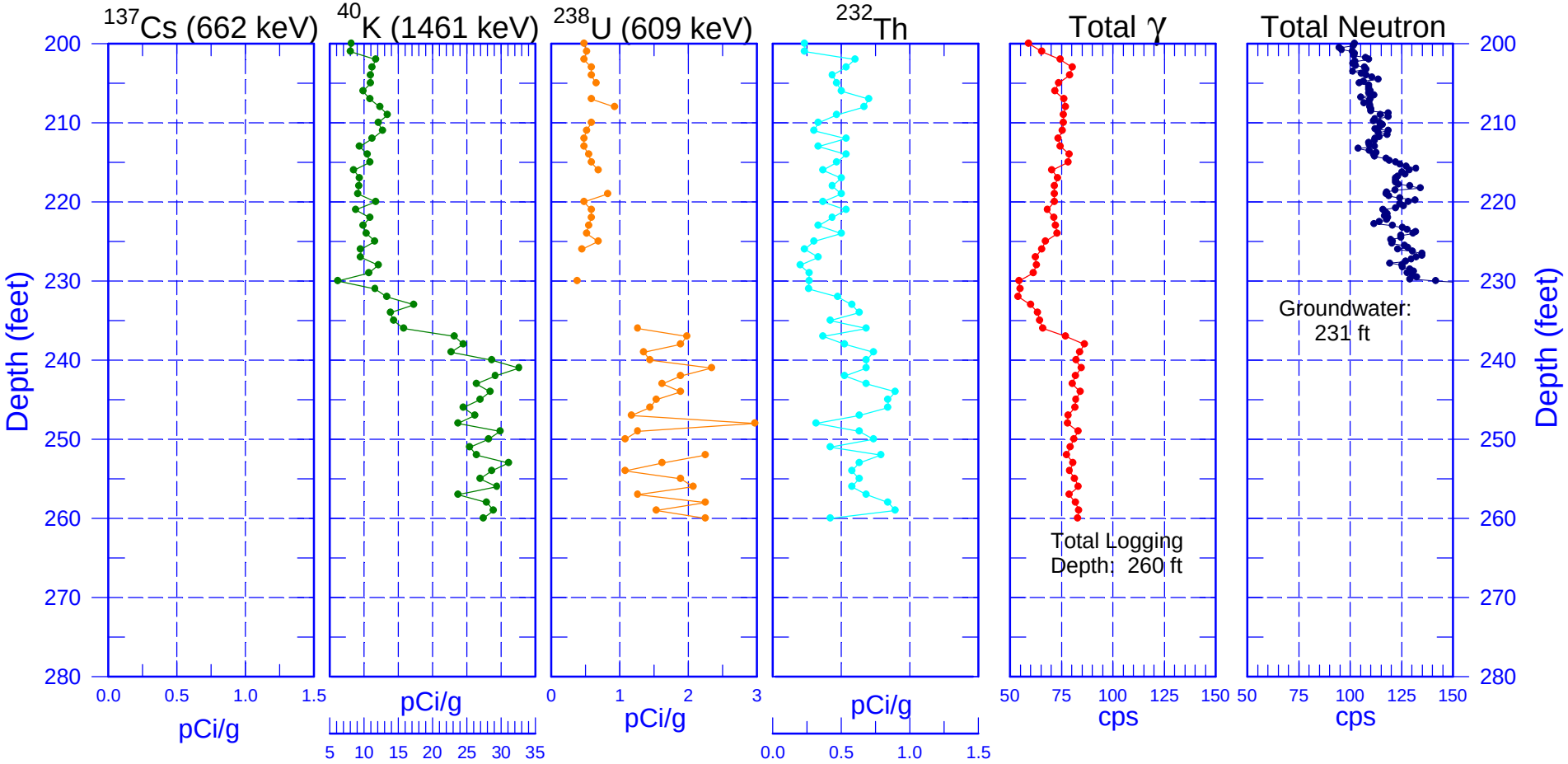
299-W40-18 (C3395) Combination Plot



299-W40-18 (C3395) Combination Plot



299-W40-18 (C3395) Combination Plot



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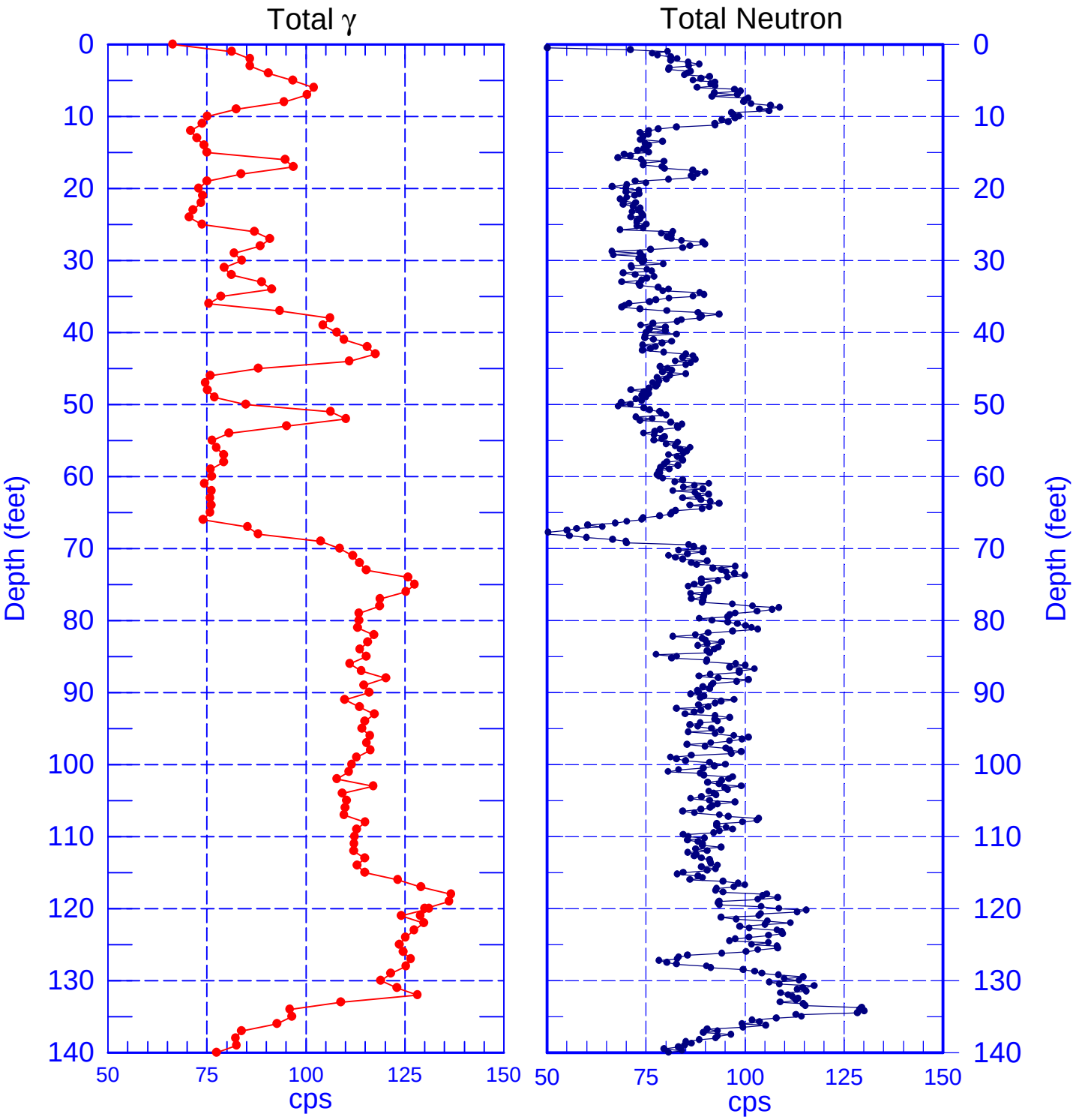

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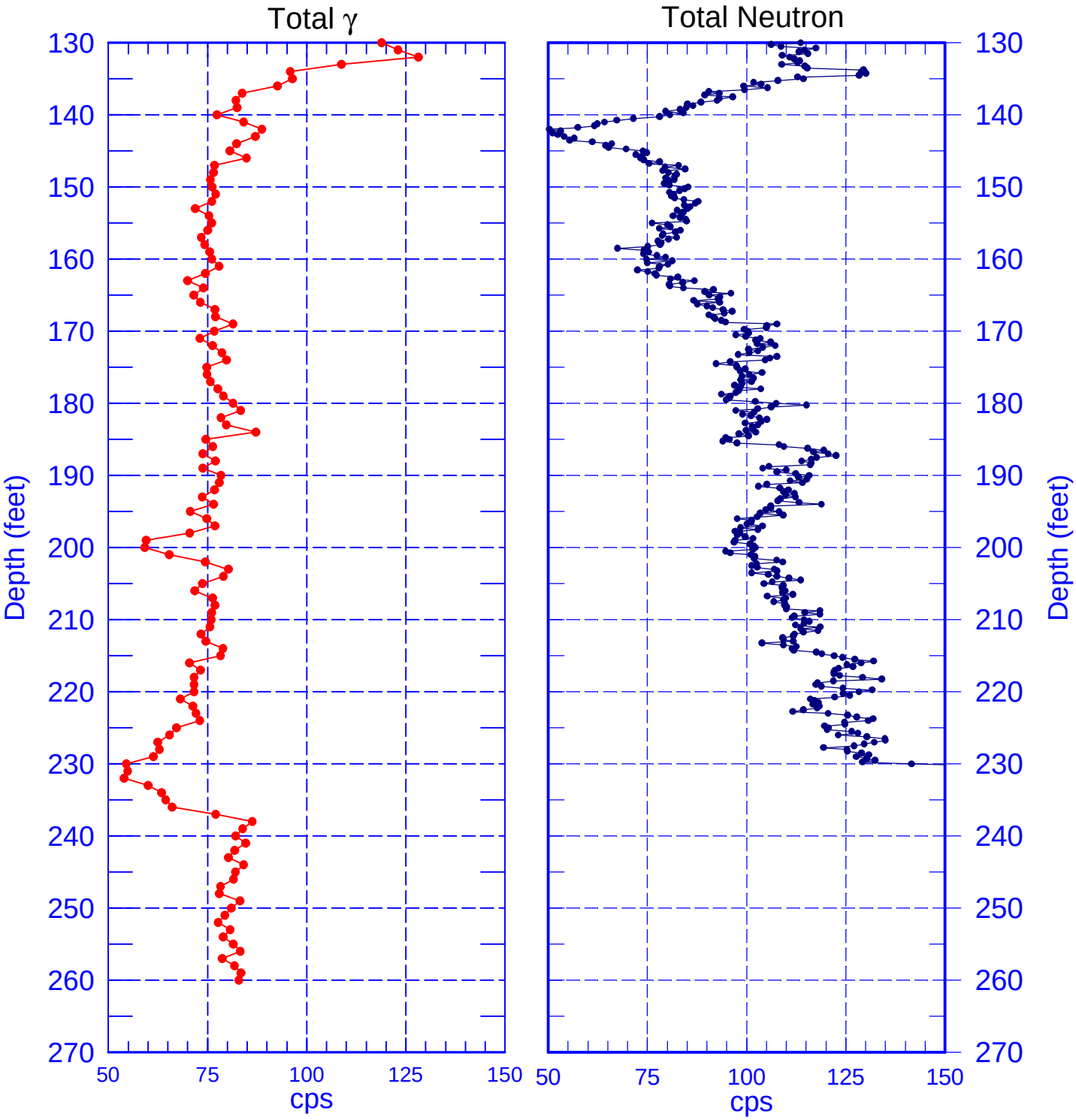

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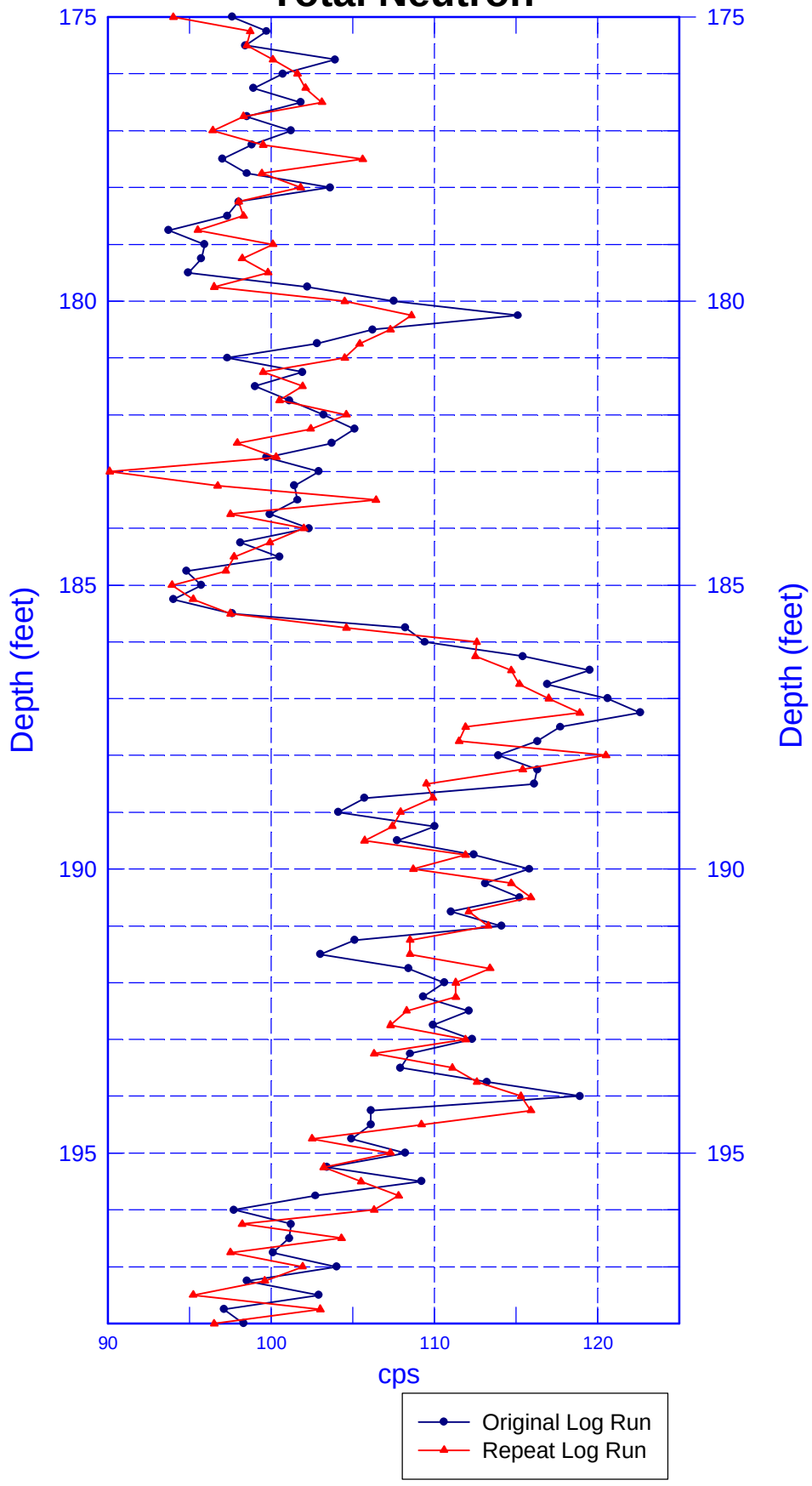
Rerun of Neutron-Moisture Log

Total Neutron



299-W18-40 (C3395)

Rerun of Natural Gamma Logs